

### Remarks

Claims 11-15 and 20 are in the present application.

The Office Action rejection of claim 20 as anticipated under 35 USC 102(b) by Goving et al (USP '351) is respectfully traversed. As this claim has been cancelled, this rejection no longer applies.

The Office Action rejection of claims 11-13 & 15 as obvious under 35 USC 103(a) over Park et al (USP '944) in view of Kurosawa et al (JP '573 A) is respectfully traversed.

This is because applicants' above claims, including 11, as amended, recite in ¶ (h) *"means for applying voltage to said coil to impose magnetic field lines in said melt such that the flow of said radial electrical current crosses said magnetic field lines to impart a stirring force to said melt ..."*, which means is not suggested nor possible by a combination of the above two cited prior art references.

That is, the above Office Action states that Park et al disclose a means for applying a magnetic field to a vessel 61 holding a seed crystal 1. The Office Action also states that Park teaches a furnace comprising a heating coil to heat the charge in the vessel 61. It is said also that Park teaches providing an electromagnet to the furnace to apply a magnetic field to the so-heated charge. Then the Office Action goes on to say that Park does not teach a small inner elongated electrode mounted within the vessel. Agreed.

However, Park et al also doesn't teach something else. It doesn't teach applicants' other electrode, though the Office Action mention's Park's gold film 33 coated on the inner surface of the inner tube 31a of the double tube 31. However, this gold thin film 33 is not connected to an electrical conductor and is not an electrode of any kind. That is, Park's gold film serves only for heat reflection to enhance heating of the melt and to allow observation therethrough of the crystal growth in the container 61. Park does not mention any voltage being applied to the film nor structurally is it possible is it possible without a conductor to do so. Again the gold film does not imply in any way imply an electrode, just a transparent furnace.

That is, the Park et al patent not only does not teach a small inner electrode, he does not teach an outer enclosing electrode, merely a gold film reflector to concentrate the heat in the furnace.

Thus if one modify Park et al by adding the electrode 2 of Kurosawa, there is still no current flow to an outer enclosing electrode in the proposed combination to make electromagnetic stirring possible. Thus the proposed combination of components from the

two references is incapable of defining an electromagnetic stirring apparatus such as found in applicants' claim 11.

The failure of such combination to generate electromagnetic stirring is not surprising given that the Kurosawa reference seeks a static electric field to prevent corrosion of his crucible while the Park apparatus installs a magnet around his melt also to provide a static magnetic field to dampen any convection motion in the melt. That is, both references are anti-stirring and are believed not combinable to accomplish the opposite result, that of electromagnetic stirring, unless one has in view applicants' own disclosure. This is hindsight reconstruction which does not establish obviousness as previously discussed. On top of that, the reconstruction does not work, as noted above.

Also to say that what applicants' apparatus, per claim 11, accomplishes, that of imparting a stirring force to the melt as merely an intended use, is not correct. This is an ability of only applicants' claimed apparatus.

The Office Action on page 4 states that there must be a structural difference between the claimed invention and the prior art to distinguish the (claimed) structure from the prior art. Such difference is present in the means for applying a voltage across inner and outer electrodes so that radial electric current crosses magnetic field lines per claim 11, f) & h) to impart a stirring force to the melt....

The apparatus proposed by combining the above two references does not provide for an electrical connection between the central anode of Kurosawa and either the steel tube 31 or the gold film 33 of Park. So the proposed hybrid structure is different structurally and is incapable of performing electromagnetic stirring, per applicants' claims 11 et seq.

That is, unlike the proposed combination of references, applicants' claimed apparatus provides an electric field in which the electric current flows uniformly from the electrode to the crucible. A current is provided to flow radially from the inner electrode to the outer electrode. The electric field vector crosses the magnetic field vector thereby causing rotation of the fluid melt. Even though the electric current is invisible, it is an essential creation of this apparatus, and inherent to this invention.

As for applicants' claims 12, 13 & 15, these are believed distinguished over the applied art in view of their dependence from claim 11, which is believed novel thereover, as discussed above.

The Office Action rejection of claim 14 as obvious under 35 USC 103(a) over the above Park and Kurosawa references and further in view of Niiura et al (USP '321) is

respectfully traversed. This claim is believed distinguished over the applied art in view of its dependence from claim 11, which is believed novel thereover, as discussed above.

In its *Response to Arguments*, the Office Action states it would be obvious to modify Park by using a crucible of different material to achieve the effect desired by Kurosawa. But that effect is a static electric field. Also Kurosawa teaches minimizing the voltage between crucible and electrode as opposed to generating same.

Also as noted by the Office Action, Park et al teaches a double tube of stainless steel having a gold film on the inside surface thereof, but they are not electrically connected to any part of the Park apparatus, and even less so to an imagined central electrode. Also the double tube serves as a water jacket for cooling purposes and the gold film serves as a heat reflector with no electrical implications suggested.

Thus there are gaps in the combination of these two references which the Office Action fills in by referring to applicants' disclosure, including adding a central electrode and wiring it to the above gold film to convert a heating reflector to an electrode. This is a stretch which can only be seen as hindsight reconstruction, which does not establish obviousness.

Finally, it is believed that the above two references are not combinable to suggest an electromagnetic stirring apparatus. This is because the Kurosawa reference teaches a static electric field to prevent corrosion of his crucible. Likewise, the Park apparatus provides the opposite of stirring by his static magnetic field. That is, Park's apparatus is designed to reduce convection in the liquid melt during crystal growth. A person skilled in the art would not think that this apparatus could be used to perform the opposite function. That is, the art teaches away from the apparatus of the claimed invention.

In view of the foregoing, the claims of record are believed distinguished over the applied art and in condition for allowance.

Respectfully submitted,



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